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EMISSIONS STUDY OF A FAIRCHILD-HILLER MODEL 1150-300 SILVER REC--ETC(U)

SEP 76 W E NORMINGTON, J W JACKSON

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Prof. Report No 76M-13
(Project No AAF-609)

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EMISSIONS STUDY OF A FAIRCHILD-HILLER MODEL 1150-300
SILVER RECLAMATION PROCESSOR (INCINERATOR)
Wright-Patterson AFB OH

By

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September 1976

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McCLELLAN AFB, CA. 95652

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USAF ENVIRONMENTAL HEALTH LABORATORY
McClellan AFB CA

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TABLE OF CONTENTS

<u>SECTION</u>	<u>Page</u>
I Summary	1
II Introduction	1
III Personnel	1
1. Wright-Patterson AFB OH	1
2. Regional Air Pollution Control Agency OH	2
3. Fairchild-Hiller	2
4. USAF Environmental Health Laboratory	2
IV Incinerator Description and Operation	2
1. Description	2
2. Operation	2
V Sampling Methods and Procedures	5
VI Applicable Standards	6
1. Visible Emissions	6
2. Particulate Emissions	6
VII Results	6
1. Visible Emissions	7
2. Particulate Emissions	7
VIII Discussion	8
1. Emissions from Refractory Lining	8
2. Test Procedures, Determining A Burn Rate	11
IX Conclusions	11
X Recommendations	13
<u>REFERENCES</u>	14
<u>TABLES</u>	
I Sequence of Events, Fairchild-Hiller Silver Reclamation Unit	5

TABLE OF CONTENTS (Cont'd)

<u>TABLES</u>		<u>Page</u>
II	Particulate Emission Rates, Fairchild-Hiller Model 1150-300, Film Incinerator/Silver Reclamation Unit	7
III	Percent by Weight of Element in Probe Rinse Ash, Fairchild-Hiller Model 1150-300, Film Incinerator/Silver Reclamation Unit	9
IV	Percent By Weight of Silver in Probe Rinse Ash and Filter Collected Ash	10
 <u>FIGURES</u>		
1	Fairchild-Hiller Incinerator (External View)	3
2	Fairchild-Hiller Incinerator (Internal View)	4
3	Average of all CO ₂ Readings Vs Time	12
 <u>APPENDIX</u>		
A	Reports of Visible Emissions	15
B	Emission Sampling Data	32
C	Analysis of Probe Ash	56
D	Silver Analysis of Filter Ash	58
E	Analysis of Refractory Lining	60

SECTION I

SUMMARY

Particulate emissions from a newly installed Fairchild-Hiller Film Incinerator/Silver Reclamation Processor were determined to evaluate compliance with applicable emission standards.

This unit is subject to two emission standards, an opacity standard and a particulate emission standard. It complied with the opacity standard but exceeded the particulate emission standard.

Evidence indicated that a large fraction of the particulate emissions may have been contributed by the refractory lining. The unit had been recently installed and operated only once prior to the tests. Ash rinsed from the sampling probe contained as much as 3% silicon and aluminum, which are major constituents of the refractory lining. There was reason to suspect that the percentage of silicon and aluminum in the total particulate matter was much greater than indicated by the probe rinse ash.

The authors are of the opinion that emissions from the refractory lining would cease with proper curing (operating the unit over a period of time), and that their elimination might reduce total emissions to less than the standard. Retesting after proper curing of the refractory lining is recommended. To assure proper curing of the primary chamber lining, film must be used as in normal operation.

SECTION II

INTRODUCTION

At the request of AFLC/DEEV and AFLC/SGB, an evaluation of plume opacity and particulate emissions from a newly installed Fairchild-Hiller Film Incinerator/Silver Reclamation Processor, Wright-Patterson AFB was conducted 13 - 19 July 1976. The objective was compliance testing with local air pollution regulations. This testing was required by the Regional Air Pollution Control Agency.

SECTION III

PERSONNEL

1. Wright-Patterson AFB OH:
 - a. Mr Thomas E. Shoup - DEEV, Project Officer

- b. 1Lt Frank T. Lubozynski - SGPB, Base Bioenvironmental Engineer
- 2. Regional Air Pollution Control Agency OH:
 - a. Mr Jerry Shoemaker - Air Pollution Control Specialist
 - b. Mr Ben Dutcher - Air Pollution Control Specialist
 - c. Mr Tom Clark - Air Pollution Control Specialist
 - d. Mr Jim Buchanan - Air Pollution Control Specialist
- 3. Fairchild-Hiller:

Mr Benjamin F. McLean - Service Representative
- 4. USAF Environmental Health Laboratory, McClellan AFB CA:
 - a. Capt William E. Normington - Project Officer
 - b. Capt Jerry W. Jackson - Consultant
 - c. Capt Marlin L. Sweigart - Engineer
 - d. Sgt William W. Conway - Laboratory Technician

SECTION IV

INCINERATOR DESCRIPTION AND OPERATION

1. Description:

Figures 1 and 2 show the basic design of the Fairchild-Hiller Film Incinerator/Silver Reclamation Processor Model 1150-300. The unit consists of a large cylindrical combustion chamber, a small afterburner section, and a stack. The entire system is refractory lined (an 84" extension was added to the top of the refractory stack for testing).

2. Operation:

The combustion chamber is loaded with film. After purging the chamber with air and preheating the afterburner section, the film is ignited by two primary burners located in the combustion chamber. The film is volatilized by partial oxidation achieved by operating the combustion chamber under starved oxygen conditions. The gas velocity

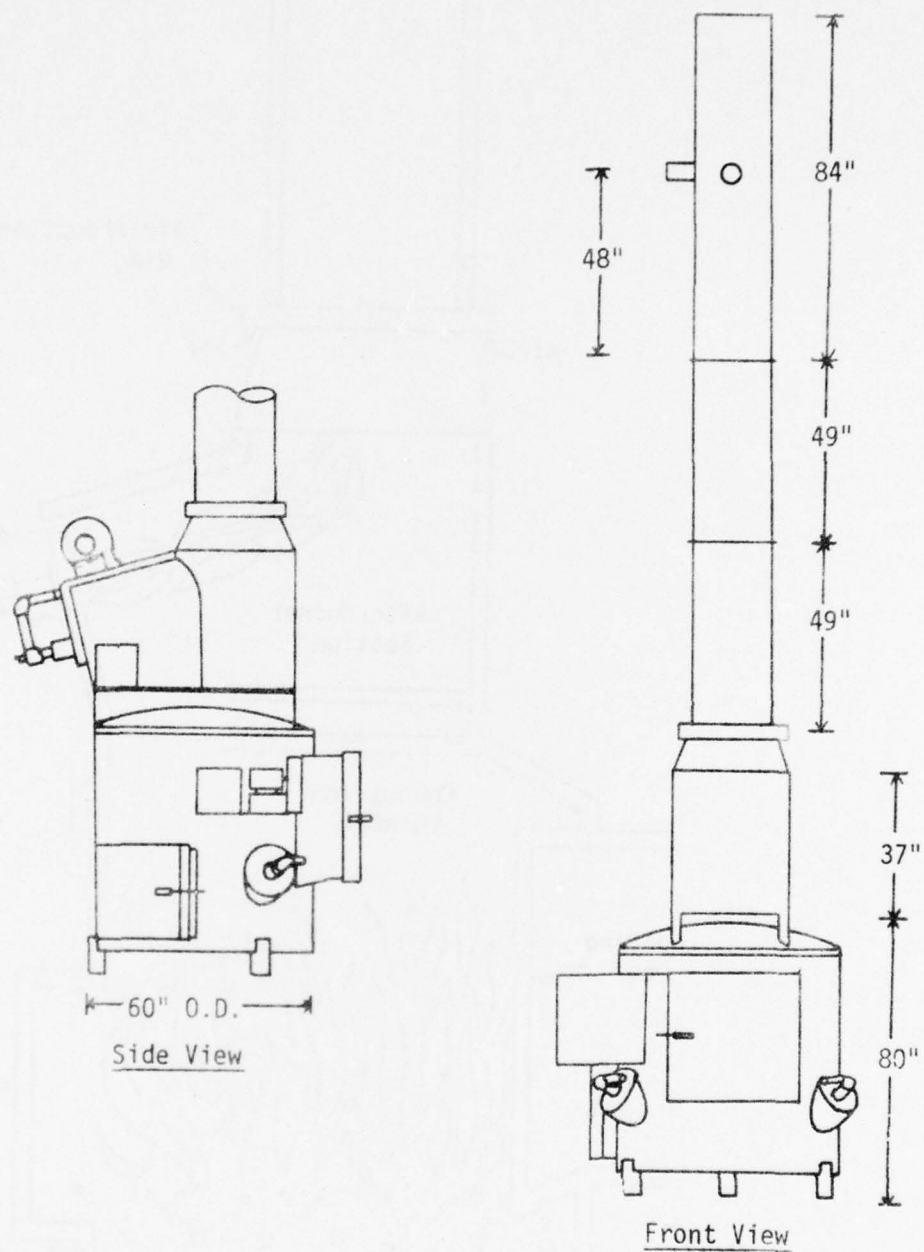


FIGURE 1
FAIRCHILD-HILLER INCINERATOR (EXTERNAL VIEW)

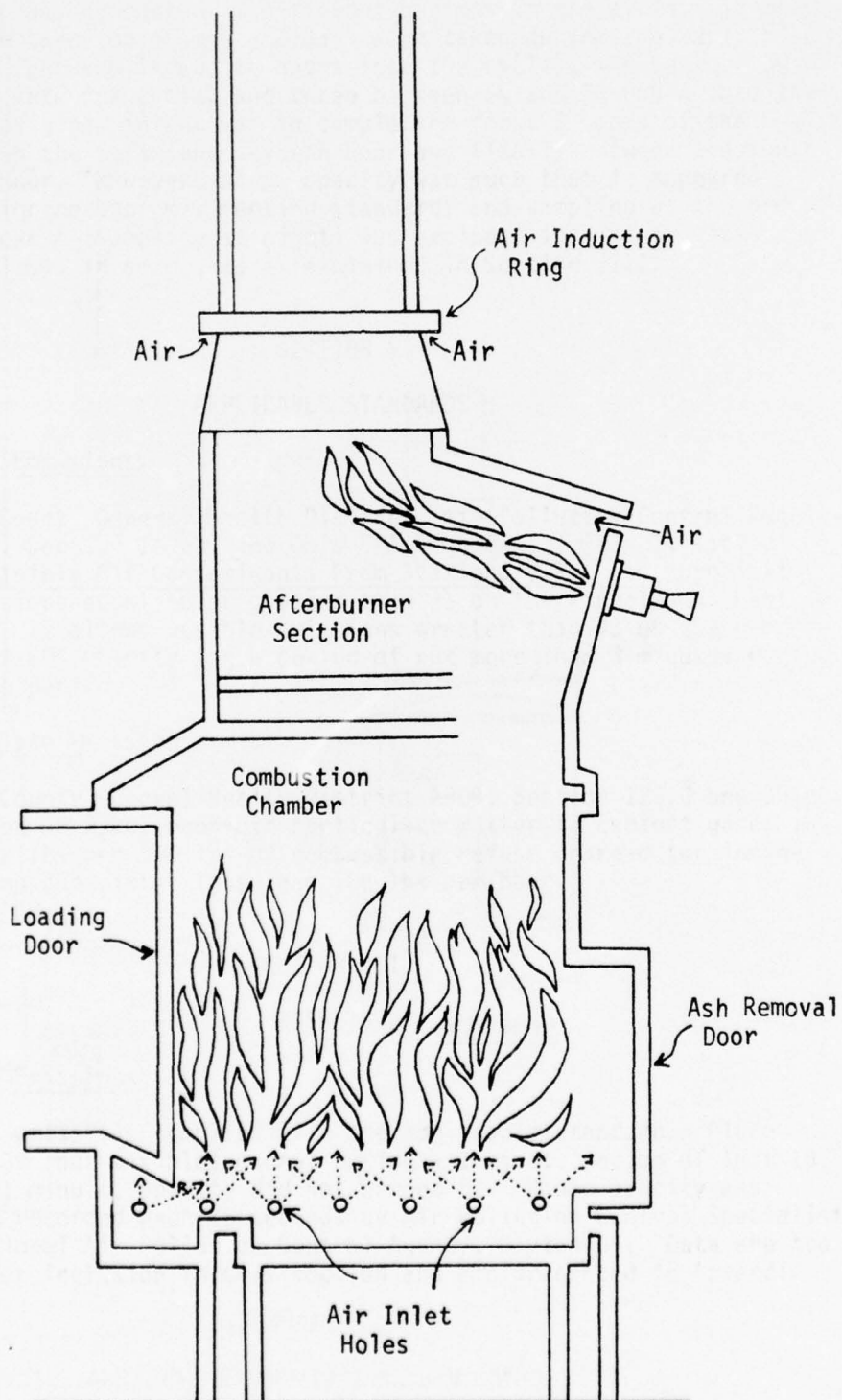


FIGURE 2
FAIRCHILD-HILLER INCINERATOR (INTERNAL VIEW)

leaving the combustion chamber is relatively low to limit the quantity of particulates entering the afterburner section. The unburned gases and particulates from the combustion chamber are passed into the afterburner flames and mixed with additional air to complete the combustion process. Additional air is introduced into the gas stream at the top of the afterburner section for cooling and velocity stabilization in the stack. The entire combustion cycle requires 12 hours for a rated film charge of 800 pounds (lbs). A typical cycle is described in Table I.

TABLE I
SEQUENCE OF EVENTS
FAIRCHILD-HILLER SILVER RECLAMATION UNIT

<u>Time Into Cycle</u>	<u>Event</u>
0 Hour	Afterburners on for preheat
1/2 Hour	Primary burners ignite and begin starved oxidation of charge (film)
1 1/2 Hours	Primary burners off (blowers remain on)
12 Hours	Afterburners off (blowers remain on)
20 Hours	Blowers off
24 Hours	Silver and ash recovered

SECTION V SAMPLING METHODS AND PROCEDURES

All sampling and calculations were done according to the procedures in the Appendix to Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Methods 1,2,3 and 5. Both the State and local regulations prescribed the American Society of Mechanical Engineers Power Test Code - PTC-27, dated 1957, entitled, "Determining Dust Concentrations in a Gas Stream," or equivalent method. The methods and procedures in 40 CFR 60, dated 1 July 1974 are equivalent to the PTC-27 Method.

To establish isokinetic sampling rates during the first test a dry gas fraction of 0.93 was assumed. This was in lieu of making a preliminary moisture determination in accordance with Method 4, 40 CFR 60. The true dry gas fraction for each test, determined from water collected during sampling, was used for all final calculations including verification of isokinetic sampling.

Sampling was conducted at different periods in the cycle. Three samples (each taken on a separate day) were taken during the early part of the cycle (between 1½ and 3½ hours into the cycle), one between 3½ and 5½ hours into the cycle, and three between 5½ and 7½ hours into the cycle. The original intent was to sample the first 2 hours of the cycle, between the fifth and seventh hour and finally between the tenth and twelfth hour. However, plume opacity was such that it appeared certain the incinerator was meeting standards and sampling at the end of the 12 hour cycle (sampling at night) was excluded for safety reasons. This protocol was in error, as is explained in Section VIII.

SECTION VI

APPLICABLE STANDARDS

1. Visible Emissions:

Greene County General Health District, Air Pollution Control Regulations (APCR), Section 140.0, and Ohio EPA Regulation AP-3-07, Titled Control of Visible Air Contaminants From Stationary Sources, prohibit visible emissions equal to or greater than #1 on the Ringelmann Chart or 20% opacity. It allows visible emissions greater than #3 on the Ringelmann Chart or 60% opacity for a period of not more than 3 minutes during any 60 minute period.

2. Particulate Emissions:

Greene County General Health District APCR, Section 125.0 and Ohio EPA Regulation AP-3-10, prohibit particulate matter in exhaust gases in excess of 0.2 lbs per 100 lbs of combustible refuse charged for incinerators having capacities less than 100 lbs per hour.

SECTION VII

RESULTS

1. Visible Emissions:

Visible emissions complied with the applicable standard. Plume opacity was 0% (not visible) except during a 1 minute period of Test 1B. During this 1 minute, opacity did not exceed 5%. Plume opacity was observed and recorded each 15 seconds by Air Pollution Control Specialists from the Regional Air Pollution Control Agency, Dayton OH. Data are too voluminous for inclusion in this section and are presented in Appendix A.

2. Particulate Emissions:

Results of the particulate emission tests are presented in Table II. Emissions during all but one of seven individual tests exceeded the applicable standard. The average emission rate for all seven tests was 0.31 lbs/100 lbs of film incinerated. The standard deviation was 0.2 lb/100 lbs. (The apparently large standard deviation is caused by the excessively large quantity of particulates found in test No 1A. It is probable that the high value in the first test was caused by spalling from an uncured refractory surface, and is quite likely anomalous. Lacking proof, the measurement may not be rejected; however, remedies may be proposed on the basis that the above assumption is correct, as discussed later.) All sampling data are presented in Appendix B.

TABLE II

PARTICULATE EMISSION RATES, FAIRCHILD-HILLER MODEL 1150-300
FILM INCINERATOR/SILVER RECLAMATION UNIT
WRIGHT-PATTERSON AFB OH
TESTED 15,17,18 & 19 JULY 1976

Test ¹	Charge (lbs)	Burn Rate ² (lbs/hr)	Particulate Emissions ³		Compliance ⁴
			(lbs/hr)	(lbs/100 lbs Burned)	
1A	568	49	0.32	0.65	Failed
1B	568	49	0.16	0.33	Failed
2A	622	54	0.09	0.17	Passed
2B	622	54	0.12	0.22	Failed
3A	604	53	0.12	0.23	Failed
3B	604	53	0.11	0.21	Failed
4	607	53	0.19	0.36	Failed
Average and Standard Deviation				0.31±0.2	

¹A Test started ~1½ hours into cycle.

B Test started ~5½ hours into cycle.

Test 4 started ~3½ hours into cycle.

²11.5 hours burn time.

³EPA Method 5

⁴Allowable emission rate is 0.2 lbs per 100 lbs of film burned.

SECTION VIII

DISCUSSION

For reasons discussed in this section, we feel that these test results are not representative of continuous operation and that the unit should be operated for an extended period of time (at least 90 days), and then be retested. This opinion is based upon evidence that indicates the refractory lining may have contributed a substantial portion of the particulate emissions, and that these emissions may be reduced sufficiently to bring the unit in compliance with standards as the refractory lining cures with continuous operation.

Also, the sampling procedure and the applicable standard will be discussed. An average burn rate based on a "worst case" situation had to be used to convert stack emissions from lbs/hr to the units in the applicable standard, lbs of particulates emitted per 100 lbs of film burned.

1. Emissions From Refractory Lining:

The percentage by weight of silicon and aluminum (major constituents of the refractory lining)+ in the ash rinsed from the sampling probe is presented in Table III. In four tests (1A, 1B, 2A and 4), a substantial portion of the ash was silicon and aluminum, and since natural gas and film do not contain these elements, it is probable that they were contributed by the refractory lining.* Excessive spalling of the lining during tests 1A, 1B and 4 may account for the very high emissions during these three tests.

* Ambient air (combustion air) was eliminated as a potential source.

+ See Appendix E.

TABLE III

PERCENT BY WEIGHT OF ELEMENT IN PROBE RINSE ASH
 FAIRCHILD-HILLER MODEL 1150-300
 FILM INCINERATOR/SILVER RECLAMATION UNIT
 WRIGHT-PATTERSON AFB OH
 TESTED 15,17,18 & 19 JULY 1976

<u>Percent Element In Probe Rinse Ash*</u>			
<u>Test</u>	<u>Silicon</u>	<u>Aluminum</u>	<u>Total</u>
1A	7.2	1.1	8.3
1B	6.4	1.1	7.5
2A	5.8	0.9	6.7
2B	1.6	0.3	1.9
3A	2.8	0.5	3.3
3B	0.9	0.3	1.2
4	4.2	0.5	4.7

* Analytical data are presented in Appendix C.

Although particulate emissions exceeded the standard (Table II) by a greater percentage than silicon and aluminum found in the probe rinse ash (Table III), and the elimination of these elements at this percentage would not reduce emissions to less than the standard, we have reason to suspect that the particulate matter collected on the filter may have contained a much larger percentage of silicon and aluminum than the probe rinse ash, and that the elimination of these elements may indeed reduce emissions to less than the standard. At this point it is necessary to explain that the filter samples were analyzed for silver content and subsequently inadvertently disposed of before the refractory problem was suspected. Consequently, the filter samples could not be analyzed for silicon and aluminum. Our suspicion that the filter catch may have contained more of these elements was based upon the fact that the percentage by weight of silver in the particulate matter collected on the filter substantially exceeded that in the probe rinse ash in all tests (Table IV). If silicon and aluminum followed this trend their percentage by weight in the total particulate matter could be substantial.*

* Note: While "silicon" and "aluminum" are referred to as the elements, they were present as silica (SiO_2) and aluminum silicate, rather than in the elemental form.

Emissions during the first, second and last test (1A, 1B and 4) were significantly greater than during the other four tests. Silicon and aluminum were also significantly greater in the probe rinse ash from these tests than in the other tests (except 2B). This could indicate that excessive spalling (cracking, stressing, chipping) of the refractory was occurring during these tests.

It should be pointed out that this unit was operated only one time prior to the first test and the refractory lining was not cured. It may be possible that the refractory cement lining characteristic of these incinerators is not adequate to withstand the conditions occurring during film incineration; even though new, the lining cracked and pieces fell into the firebox during the course of testing. If this hypothesis is true, it is likely that none of these incinerators can meet the particulate requirement even after curing. Two other similar units tested in 1972 exceeded standards and had highly irregular emission rates (Ref. 5). It is, however, advisable to cure and retest, in the interest of economy, rather than assuming an inadequately resistant refractory lining, and replacing them without retesting. It is also possible that oxides of nitrogen formed from high-temperature air, from film emulsion, or perhaps nitrocellulose film, may cause an acid attack on the upper portions of the stack. This possibility will be investigated in future tests.

TABLE IV

PERCENT BY WEIGHT OF SILVER IN
PROBE RINSE ASH AND FILTER COLLECTED ASH*

Test	Probe Rinse Ash	Percent Silver	
		Filter Collected Ash	
1A	0.6		1.9
1B	1.6		4.2
2A	1.3		5.6
2B	1.0		4.2
3A	2.4		3.8
3B	0.7		8.8
4	0.5		4.6

* Analytical data are presented in Appendix D.

2. Test Procedures, Determining A Burn Rate:

The application of an average burn rate (lbs of film/11.5 hour burn cycle) as used in these tests to convert stack emission in lbs/hr to units of the applicable standard (lbs particulates/100 lbs film) is questionable because the burn rate varies with time. As the plot of carbon dioxide versus time in Figure 3 indicates, maximum oxidation occurred early in the burn cycle during the A tests. It then tapered off as the cycle continued. The most accurate procedure, and the one intended for use in these tests, is to take 2 hour samples throughout the burn cycle, plot the emission rates in lbs/hr, integrate the curve, and then divide by the weight of initial charge in hundreds of pounds. This procedure was not used in these tests because samples were not taken from the latter part of the burn cycle. These latter samples were not taken because the visible emission observations (0% opacity) led us to believe the incinerator was meeting standards.

Unfortunately, the nature of the emissions was such that even though they were not visible, they were present. This fact tends to confirm the hypothesis that they were mainly refractory particles.

SECTION IX

CONCLUSIONS

1. Emissions from this unit complied with the applicable visible emission standard but did not comply with the applicable particulate emission standard.
2. A significant fraction of the particulate emission may have been contributed by the incinerator's refractory lining. These emissions may or may not cease with time depending upon the characteristics of the refractory material. The elimination of these emissions may or may not decrease total emissions below the standard.
3. Because of the probable emissions from the refractory lining and the possibility that they would cease after proper curing of the refractory, these tests should be considered invalid.
4. The unit should be retested but only after it is operated for an extended period of time, say 90 days, to assure curing of the refractory lining.
5. If the incinerator fails upon retesting, and the presence of refractory particles is proved to be the cause of failure, a more adequate refractory must be sought, unless a variance for this class of incinerator can be obtained.

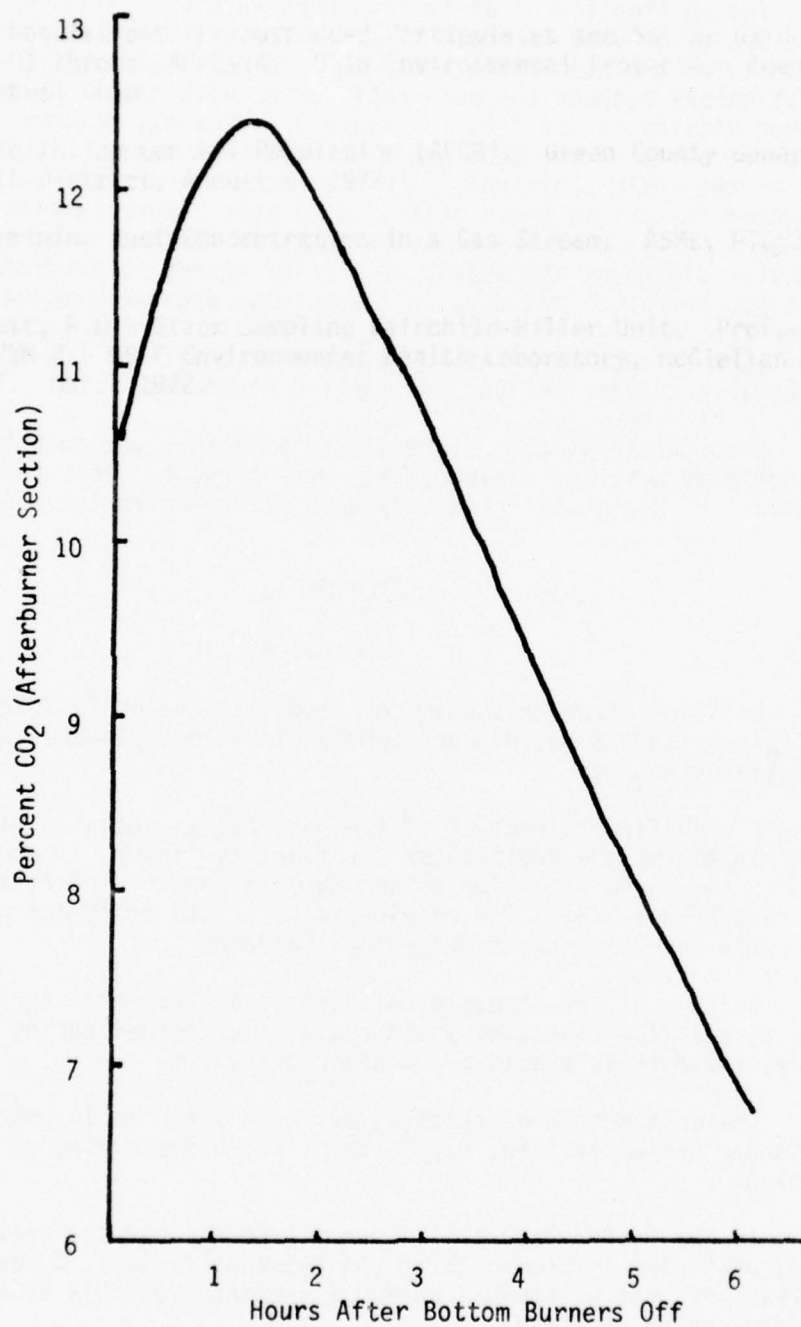


FIGURE 3
AVERAGE OF ALL CO₂ READINGS VS TIME

SECTION X

RECOMMENDATIONS

1. The unit should be retested but only after it has been operated for a sufficient time to assure proper curing of the refractory lining. An expert in the field of refractory lining should be consulted to establish the required curing time. A normal charge of film must be used during these curing burns to assure high primary chamber temperature.
2. Procedures for retesting should be as follows:
 - a. The incinerator should be charged to its rated capacity of 800 lbs.
 - b. Emission tests should be conducted throughout the 12 hour burn cycle and emissions integrated over this period. This would eliminate the need to assume an average burn rate, i.e., 800 lbs/11.5 hours.
 - c. Both the filter collected sample and the probe rinse sample of particulate matter should be analyzed for silicon and aluminum.
 - d. Samples of the film should be analyzed (if it is possible to obtain a sample because of the highly classified nature of the film) for silicon and aluminum.
 - e. Background emission tests should be conducted, i.e., operate the unit as usual but do not charge it with film.
 - f. Particles should be measured with optical or electron microscope to determine why they are not visible (size distribution).

REFERENCES

1. 40 CFR 60 (Code of Federal Regulations), July 1, 1975.
2. Ohio Regulations for Suspended Particulates and Sulfur Oxides, AP-3-01 through AP-3-14. Ohio Environmental Protection Agency, Columbus, Ohio.
3. Air Pollution Control Regulation (APCR). Green County General Health District, August 5, 1972.
4. Determining Dust Concentration in a Gas Stream. ASME, PTC 27, 1957.
5. Burnett, R.D. Stack Sampling Fairchild-Hiller Unit. Prof. Report No. 72M-7. USAF Environmental Health Laboratory, McClellan AFB, Calif. March 1972.

APPENDIX A

REPORTS OF VISIBLE EMISSIONS

TABLE A-1

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

Dayton, Ohio 45402

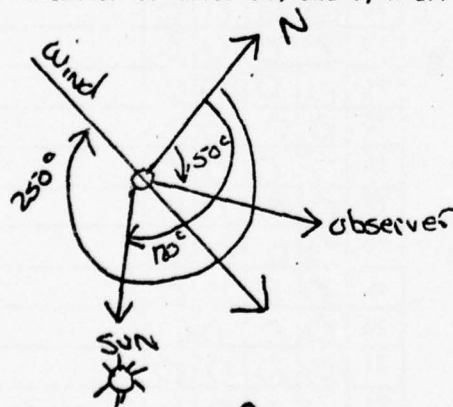
Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER J. BuchananLOCATION: NAME WPAFBDATE 7/15/76ADDRESS Bldg #294OBSERVATION BEGAN 10:31 ENDED 11:01Test 1 RUN 1SOURCE DESCRIPTION ConsumatIncinerator - FilmOBSERVATION POINT 70 feet fromStack 50° from North ^{see} belowSTACK: Distance From 70 Height ~22 ft.WIND: Direction 250° Speed ~5 mphSKY CONDITION Clear Air Temp. 88 °FPLUME BACKGROUND Blue

PLUME COLOR _____

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.

AVERAGE OPACITY 0 %TOTAL READING TIME 30 min.REMARKS Preheat started 9:23lower burners ON 10:05

MIN.	SECONDS				COMMENTS
	00	15	30	45	
00	0	0	0	0	
01	0	0	0	0	
02	0	0	0	0	
03	0	0	0	0	
04	0	0	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	

TABLE A-II

REGIONAL AIR POLLUTION CONTROL AGENCY

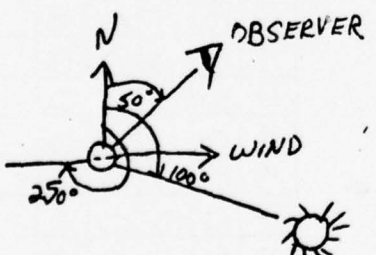
451 West Third Street

Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER Jerry L Shoemaker LOCATION: NAME WPAFB
 DATE Jul 15, 1976 ADDRESS Bldg. 294
 OBSERVATION BEGAN 11:00 AM ENDED 11:30 AM w/sunglasses
TEST 1 RUN 1

SOURCE DESCRIPTION	MIN.	SECONDS				COMMENTS
		00	15	30	45	
<u>Fairchild Incinerator</u>	00	0	0	0	0	
OBSERVATION POINT <u>NNE of stack</u>	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
STACK: Distance From <u>70 ft.</u> Height <u>22 ft.</u>	04	0	0	0	0	
WIND: Direction <u>W</u> Speed <u>5</u> mph	05	0	0	0	0	
SKY CONDITION <u>clear</u> Air Temp. <u>86</u> °F	06	0	0	0	0	
PLUME BACKGROUND <u>solid blue sky</u>	07	0	0	0	0	
PLUME COLOR <u>clear</u>	08	0	0	0	0	
SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow. 	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

AVERAGE OPACITY 0 %
 TOTAL READING TIME 30 min.
 REMARKS

TABLE A-III

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

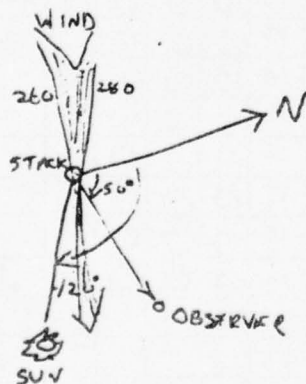
Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER DUTCHER, BEN W.LOCATION: NAME WPAFBDATE July 15 1974ADDRESS old 294OBSERVATION BEGAN 1132 ENDED 1147Test 1 Run 1SOURCE DESCRIPTION Fairchild (Consistent) Stained AirSilver Reclamation separator, nat'l gasOBSERVATION POINT NE of stackSTACK: Distance From 70 Height ~22 ft.WIND: Direction 260 Speed 3-5 mphSKY CONDITION clear Air Temp. 90 °FPLUME BACKGROUND blue skyPLUME COLOR none

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.

AVERAGE OPACITY 0 %TOTAL READING TIME 15 min.REMARKS 568 lb change roughly
photo. film

MIN.	SECONDS				COMMENTS
	00	15	30	45	
00	0	0	0	0	
01	0	0	0	0	
02	0	0	0	0	
03	0	0	0	0	
04	0	0	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0				
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					

TABLE A-IV

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

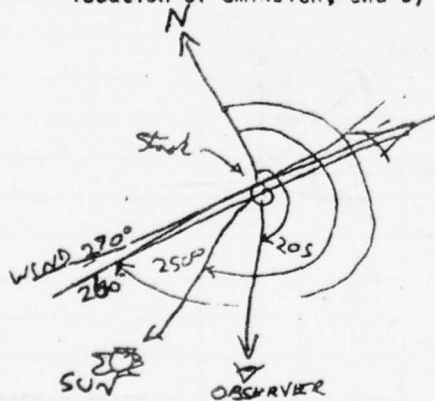
Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER B. W. PritchardLOCATION: NAME WPAFBDATE July 15 1976ADDRESS BLDG 294OBSERVATION BEGAN 3 23 ENDED 3 43Test 1 Run 2SOURCE DESCRIPTION Fairchild (dominant)Silver Reclamation - CincinnatiOBSERVATION POINT SW of stackSTACK: Distance From 50 Height 22 ft.WIND: Direction W Speed 8-9 mphSKY CONDITION 80% overcast Air Temp. 90 °FPLUME BACKGROUND Blue Sky, Gray CloudPLUME COLOR clear & white

SKETCH: include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) if arrow.

AVERAGE OPACITY 0 %TOTAL READING TIME 20 min.

REMARKS

MIN.	SECONDS				COMMENTS
	00	15	30	45	
00	0	0	0	0	3.20 - 1st reading slight
01	0	0	0	0	5% VE against the
02	3	5	0	0	trees, + 20 began these
03	5	0	0	0	readings
04	0	5	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	← Bill noticed that his
13	0	0	0	0	adapters above in the wind
14	0	0	0	0	unusual part was burning
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	M says breeze missing in
19	0	0	0	0	his velocity
20	0				353-6000 marking
21					strongly again
22					
23					405 hour chamber blower
24					cycling on off every few min
25					to be expected
26					4.25 3m from Cincinnati
27					adjusted set point higher
28					

TABLE A-V

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER B.W. DubeLOCATION: NAME WPAFBDATE July 15 1976ADDRESS Bldg 294OBSERVATION BEGAN 4:11 pm ENDED 4:21Test 1 Run 2SOURCE DESCRIPTION Finished Aluminum

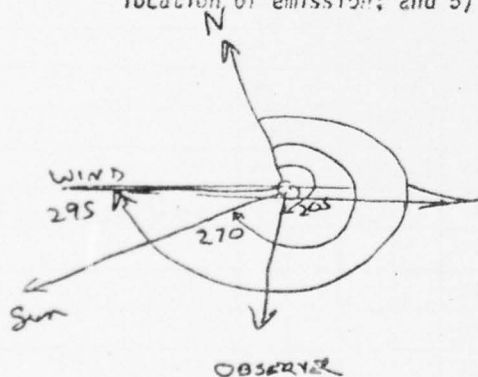
MIN. SECONDS

00 15 30 45

COMMENTS

00 ☒ ☒ ☒ ☒ Stk. Temp was down to ~86.5OBSERVATION POINT SW of stack01 ☒ ☒ ☒ ☒02 ☒ ☒ ☒ ☒03 ☒ ☒ ☒ ☒STACK: Distance From 30 Height 22 ft.04 ☒ ☒ ☒ ☒WIND: Direction 295 Speed 5-7 mph05 ☒ ☒ ☒ ☒SKY CONDITION 50% cover Air Temp. 90 °F06 ☒ ☒ ☒ ☒PLUME BACKGROUND Blue07 ☒ ☒ ☒ ☒PLUME COLOR den08 ☒ ☒ ☒ ☒09 ☒ ☒ ☒ ☒

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.

AVERAGE OPACITY 10 %TOTAL READING TIME 10 min.

REMARKS

TABLE A-VI

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER B W Dutcher LOCATION: NAME WPAFBDATE July 15 1976 ADDRESS Bldg 294OBSERVATION BEGAN 446 ENDED 504Test 1 Run 2

SOURCE DESCRIPTION	MIN.	SECONDS				COMMENTS
		00	15	30	45	
1	00	0	0	0	0	at temp = ~880
OBSERVATION POINT <u>SW of stack:</u>	01	0	0	0	0	
	02	0	0	0	0	looks like rain soon
	03	0	0	0	0	
STACK: Distance From <u>50'</u> Height <u>~22</u> ft.	04	0	0	0	0	
WIND: Direction <u>W</u> Speed <u>7-8</u> mph	05	0	0	0	0	
SKY CONDITION <u>80% overcast</u> Air Temp. <u>88</u> °F	06	0	0	0	0	
PLUME BACKGROUND <u>grey cloud</u>	07	0	0	0	0	
PLUME COLOR <u>clear</u>	08	0	0	0	0	
SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.	09	0	0	0	0	to page
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	end of run 2
	18					
	19					
	20					
	21					
AVERAGE OPACITY <u>0</u> %	22					
TOTAL READING TIME <u>18</u> min.	23					
REMARKS	24					
	25					
	26					
	27					
	28					

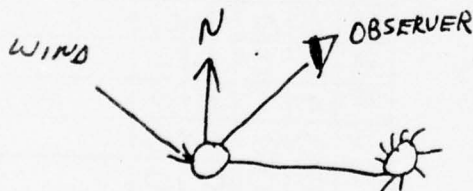
TABLE A-VII
REGIONAL AIR POLLUTION CONTROL AGENCY
451 West Third Street
Dayton, Ohio 45402
Phone: 225-4435

page 1 of 2

REPORT OF VISIBLE EMISSIONS

OBSERVER Jerry L Shoemaker LOCATION: NAME WPAFB
DATE July 17, 1976 ADDRESS Bldg. 294
OBSERVATION BEGAN 9:00 AM ENDED 9:54 AM
TEST 2 RUN 1 w/sunglasses

SOURCE DESCRIPTION	MIN.	SECONDS				COMMENTS
		00	15	30	45	
FAIRCHILD Incinerator	00	0	0	0	0	
OBSERVATION POINT <u>NE of stack</u>	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
STACK: Distance From <u>60 ft</u> Height <u>22 ft.</u>	04	0	0	0	0	
WIND: Direction <u>NW</u> Speed <u>2-4</u> mph	05	0	0	0	0	
SKY CONDITION <u>clear</u> Air Temp. <u>63</u> °F	06	0	0	0	0	
PLUME BACKGROUND <u>solid blue</u>	07	0	0	0	0	
PLUME COLOR <u>clear</u>	08	0	0	0	0	
	09	0	0	0	0	
SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	



AVERAGE OPACITY _____ %
TOTAL READING TIME 54 min.
REMARKS _____

TABLE A-VIII

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

Dayton, Ohio 45402

Phone: 225-4435

page 2 of 2

REPORT OF VISIBLE EMISSIONS

OBSERVER Verry L Shoemaker LOCATION: NAME WPAFBDATE July 12, 1976 ADDRESS Bldg 294OBSERVATION BEGAN 9:00am ENDED 9:54

TEST 2 RUN 1

w/ sunglasses

SOURCE DESCRIPTION	MIN.	SECONDS				COMMENTS
		00	15	30	45	
	00	0	0	0	0	
	01	0	0	0	0	
	02	0	0	0	0	
	03	0	0	0	0	
	04	0	0	0	0	
	05	0	0	0	0	
	06	0	0	0	0	
	07	0	0	0	0	
	08	0	0	0	0	
	09	0	0	0	0	
	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0	0	0	0	
	16	0	0	0	0	
	17	0	0	0	0	
	18	0	0	0	0	
	19	0	0	0	0	
	20	0	0	0	0	
	21	0	0	0	0	
	22	0	0	0	0	
	23	0	0	0	0	
	24	0	0	0	0	
	25	0	0	0	0	
	26	0	0	0	0	
	27	0	0	0	0	
	28	0	0	0	0	
	29	0	0	0	0	

STACK: Distance From _____ Height _____ ft.

WIND: Direction _____ Speed _____ mph

SKY CONDITION _____ Air Temp. _____ of _____

PLUME BACKGROUND _____

PLUME COLOR _____

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.

AVERAGE OPACITY _____ %

TOTAL READING TIME _____ min.

REMARKS _____

TABLE A-IX

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

Dayton, Ohio 45402

Phone: 225-4435

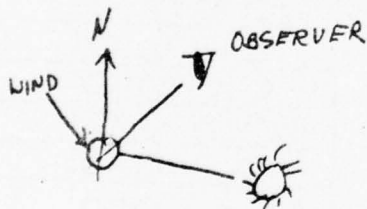
REPORT OF VISIBLE EMISSIONS

OBSERVER Jerry L ShoemakerLOCATION: NAME WPAFBDATE July 17, 1976ADDRESS Bldg 294OBSERVATION BEGAN 10:45 AM ENDED 11:15 AMw/ sunglassesTEST 2 RUN 1SOURCE DESCRIPTION Fairchild IncineratorMIN. SECONDS
00 15 30 45

COMMENTS

OBSERVATION POINT NE of stackSTACK: Distance From 55 ft. Height ~22 ft.WIND: Direction NW Speed 5 mphSKY CONDITION clear Air Temp. 70 °FPLUME BACKGROUND solid bluePLUME COLOR clear

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.



AVERAGE OPACITY _____ %

TOTAL READING TIME 30 min.

REMARKS _____

TABLE A-X
REGIONAL AIR POLLUTION CONTROL AGENCY
451 West Third Street
Dayton, Ohio 45402
Phone: 223-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER Datcher, R. W.

LOCATION: NAME WPAFB

DATE July 18 1976

ADDRESS Bldg 294

OBSERVATION BEGAN 933 ENDED 1003
Test 3 Run

SOURCE DESCRIPTION Facility

MIN. SECONDS
00 15 30 45

COMMENTS

Exhaust

00 ☐ ☐ ☐ ☐

Lower burner vent off
about 9:04

OBSERVATION POINT SSE of stack

01 ☐ ☐ ☐ ☐

02 ☐ ☐ ☐ ☐

03 ☐ ☐ ☐ ☐

Test began 9:18 am

STACK: Distance From 60 Height ~22 ft.

04 ☐ ☐ ☐ ☐

WIND: Direction 0 Speed 0 mph

05 ☐ ☐ ☐ ☐

SKY CONDITION clear Air Temp. 68 °F

06 ☐ ☐ ☐ ☐

PLUME BACKGROUND blue

07 ☐ ☐ ☐ ☐

PLUME COLOR clear

08 ☐ ☐ ☐ ☐

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) if arrow.

09 ☐ ☐ ☐ ☐

10 ☐ ☐ ☐ ☐

11 ☐ ☐ ☐ ☐

12 ☐ ☐ ☐ ☐

13 ☐ ☐ ☐ ☐

14 ☐ ☐ ☐ ☐

15 ☐ ☐ ☐ ☐

16 ☐ ☐ ☐ ☐

17 ☐ ☐ ☐ ☐

18 ☐ ☐ ☐ ☐

19 ☐ ☐ ☐ ☐

20 ☐ ☐ ☐ ☐

21 ☐ ☐ ☐ ☐

22 ☐ ☐ ☐ ☐

23 ☐ ☐ ☐ ☐

24 ☐ ☐ ☐ ☐

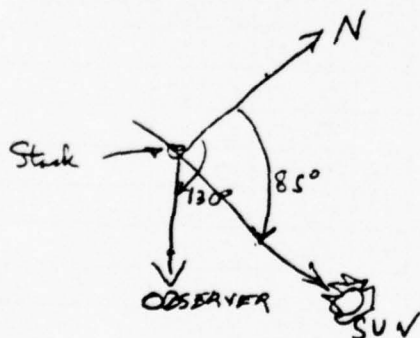
25 ☐ ☐ ☐ ☐

26 ☐ ☐ ☐ ☐

27 ☐ ☐ ☐ ☐

28 ☐ ☐ ☐ ☐

29 ☐ ☐ ☐ ☐



AVERAGE OPACITY 0 %

TOTAL READING TIME 30 min.

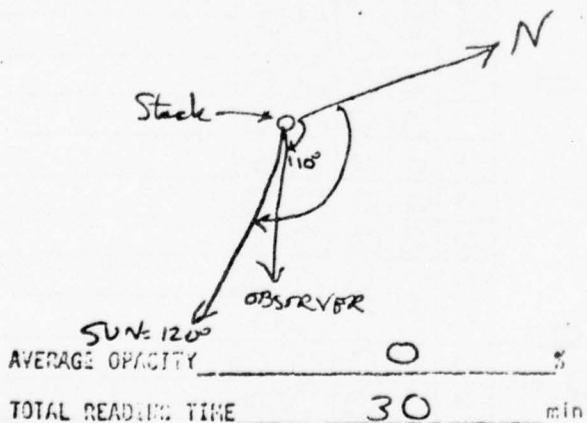
REMARKS 604 lb change

TABLE A-XI
REGIONAL AIR POLLUTION CONTROL AGENCY
451 West Third Street
Dayton, Ohio 45402
Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER Datch, Ben W. LOCATION: NAME WPAFB
DATE July 18 1976 ADDRESS 294
OBSERVATION BEGAN 1034 ENDED 1104
Test 3 Run 1

SOURCE DESCRIPTION	MIN.	SECONDS				COMMENTS
		00	15	30	45	
<u>Exhausted Silver</u>	00	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<u>Reclamation Incinerator</u>	01	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
OBSERVATION POINT <u>SE of stack</u>	02	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	03	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
STACK: Distance From <u>70</u> Height <u>~22</u> ft.	04	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
WIND: Direction <u>0</u> Speed <u>0</u> mph	05	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
SKY CONDITION <u>clear</u> Air Temp. <u>68</u> °F	06	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
PLUME BACKGROUND <u>blue</u>	07	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
PLUME COLOR <u>clear</u>	08	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	09	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.	10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	12	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	14	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	16	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	17	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	18	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	19	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	20	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	21	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	22	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	23	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	24	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	25	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	26	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	27	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	28	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	29	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	



AVERAGE OPACITY 0

TOTAL READING TIME 30 min.

REMARKS

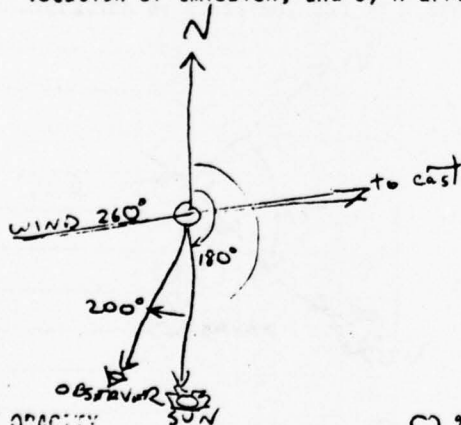
TABLE A-XII

451 West Third Street
Dayton, Ohio 45402
Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER B. W. DutcherLOCATION: NAME WPAFBDATE July 18, 1976ADDRESS Bldg. 294OBSERVATION BEGAN 143 pm ENDED 213 pm
Test 3 Run 2SOURCE DESCRIPTION Fairchild SilverReduction InverterOBSERVATION POINT SW of StackSTACK: Distance From 30 Height ~22 ft.WIND: Direction from W Speed ~3-5 mphSKY CONDITION 5% clouds Air Temp. 73 °FPLUME BACKGROUND bluePLUME COLOR clear

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.

AVERAGE OPACITY 0 %TOTAL READING TIME 30 min.

REMARKS

MIN.	SECONDS				COMMENTS
	00	15	30	45	
00	0	0	0	0	Test Run began 1:25
01	0	0	0	0	
02	0	0	0	0	
03	0	0	0	0	
04	0	0	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	01

TABLE A-XIII

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

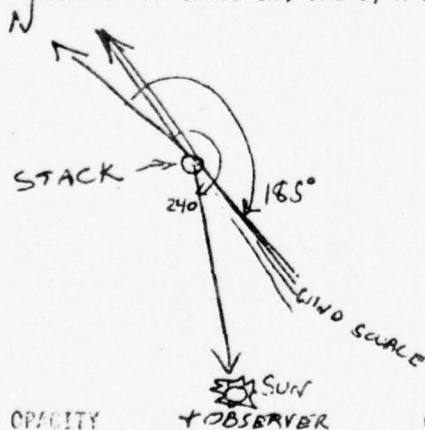
Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER B.W. DutcherLOCATION: NAME WPAFBDATE July 18, 1976ADDRESS Bldg 294OBSERVATION BEGAN 3:04 pm ENDED 3:31Test 3 Run 2SOURCE DESCRIPTION Fairchild SilverReclamation sluicewayOBSERVATION POINT SW of stackSTACK: Distance From 50' Height ~22' ft.WIND: Direction South Speed ~3 mphSKY CONDITION 30% cover Air Temp. 79 °FPLUME BACKGROUND blue sky, white cloudsPLUME COLOR clear

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emissions; and 5) N arrow.

AVERAGE CAPACITY 0%TOTAL READING TIME 27 min.

REMARKS

End of Run

TABLE A-XIV
REGIONAL AIR POLLUTION CONTROL AGENCY
451 West Third Street
Dayton, Ohio 45402
Phone: 225-4455

REPORT OF VISIBLE EMISSIONS

OBSERVER B.W. Dutcher

LOCATION: NAME WPAFB

DATE July 19, 1976

ADDRESS Bldg. 294

OBSERVATION BEGAN 1100 ENDED 1130 am
Test 4 Run 1

SOURCE DESCRIPTION Fairchild Silver
Reclamation evaporator

OBSERVATION POINT SE of stack

STACK: Distance From 70 Height ~22 ft.

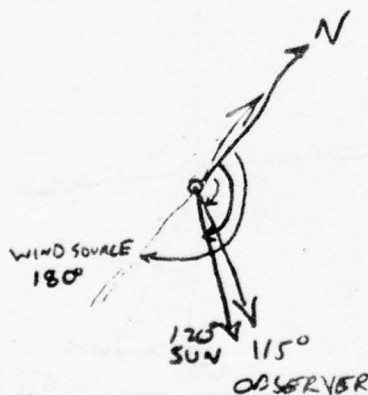
WIND: Direction 180° Speed 0-3 mph

SKY CONDITION blue Air Temp. 74 °F

PLUME BACKGROUND blue

PLUME COLOR clear

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) plume arrow.



AVERAGE OPACITY 0%

TOTAL READING TIME 30 min.

REMARKS 606.5 lb change

Run began 1055 am

Run began again 8:10 am

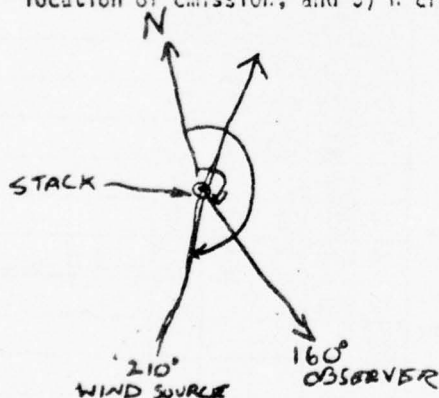
PATH.	SECONDS				COMMENTS
	00	15	30	45	
00	0	0	0	0	
01	0	0	0	0	
02	0	0	0	0	
03	0	0	0	0	
04	0	0	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	

TABLE A-XV
REGIONAL AIR POLLUTION CONTROL AGENCY
451 West Third Street
Dayton, Ohio 45402
Phone: 225-4455

REPORT OF VISIBLE EMISSIONS

OBSERVER B.W. Dutcher LOCATION: NAME WPAFB
DATE July 19, 1976 ADDRESS Bldg 294
OBSERVATION BEGAN 1150 AMENDED 1205
Test 4 Run 1

SOURCE DESCRIPTION	MIN.	SECONDS				COMMENTS
		00	15	30	45	
<u>Fairchild Schem</u>						
<u>Pictometer</u>						
OBSERVATION POINT <u>So. of stack</u>	00	0	0	0	0	ish flakes
	01	0	0	0	0	ish
	02	0	0	0	0	ish
	03	0	0	0	0	
STACK: Distance From <u>40</u> Height <u>~22</u> ft.	04	0	0	0	0	ish
WIND: Direction _____ Speed <u>3-4</u> mph	05	0	0	0	0	
SKY CONDITION <u>clear</u> Air Temp. <u>75</u> °F	06	0	0	0	0	
PLUME BACKGROUND <u>blue</u>	07	0	0	0	0	
PLUME COLOR <u>clear</u>	08	0	0	0	0	
	09	0	0	0	0	
SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) arrow.	10	0	0	0	0	
	11	0	0	0	0	
	12	0	0	0	0	
	13	0	0	0	0	
	14	0	0	0	0	
	15	0				
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					



AVERAGE OPACITY 0%
TOTAL READING TIME 15 min.
REMARKS _____

TABLE A-XVI

REGIONAL AIR POLLUTION CONTROL AGENCY

451 West Third Street

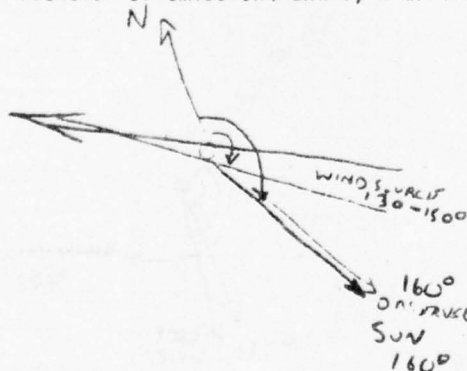
Dayton, Ohio 45402

Phone: 225-4435

REPORT OF VISIBLE EMISSIONS

OBSERVER B.W. DutcherLOCATION: NAME WPAFBDATE July 19, 1976ADDRESS Bldg 294OBSERVATION BEGAN 1240 pm ENDED 1259
Test 4 Run 1SOURCE DESCRIPTION Fairchild SilverReclaimator eliminaterOBSERVATION POINT SE of stackSTACK: Distance From 50 Height 22 ft.WIND: Direction SE Speed ~0-5 mphSKY CONDITION light haze Air Temp. 75 °FPLUME BACKGROUND light bluePLUME COLOR clear

SKETCH: Include 1) wind direction; 2) sun position; 3) observer position; 4) location of emission; and 5) N arrow.

AVERAGE OPACITY 0%TOTAL READING TIME 19 min.

REMARKS

MIN.	SECONDS				COMMENTS
	00	15	30	45	
00	0	0	0	0	
01	0	0	0	0	
02	0	0	0	0	
03	0	0	0	0	
04	0	0	0	0	
05	0	0	0	0	
06	0	0	0	0	
07	0	0	0	0	
08	0	0	0	0	
09	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	end of run
19	0				
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

APPENDIX B

EMISSION SAMPLING DATA

TABLE B-1

SUMMARY OF EMISSION SAMPLING DATA
 FAIRCHILD-HILLER MODEL 1150-300,
 INCINERATOR/SILVER RECLAMATION PROCESSOR
 WRIGHT-PATTERSON OH
 TESTED 15,17,18 & 19 JULY 1976

Day	Run	Particulate (lb/hr)	Stack (°F)	Temp Afterburner (°F)	H ₂ O Stack (%)	Stack (%)	CO ₂ Afterburner (%)	Stack Flow (ft ³ /min)*	Charge Film (lbs)	Ash [†] (%)	Isokinetic (%)
1	1A	.3156	1070	2100	8.2	4.8	11.2	792	568	3.7	98.8
1	1B	.1610	895	1700	6.6	4.2	7.5	756	568	3.7	97.8
2	2A	.0899	1058	2060	8.3	4.9	11.8	808	621	4.5	99.7
2	2B	.1239	892	1650	5.6	3.1	7.2	830	621	4.5	97.2
3	3A	.1233	1101	2100	6.8	4.4	12.9	819	604	3.1	97.7
3	3B	.1093	918	1700	5.3	3.0	8.5	813	604	3.1	97.6
4	4	.1915	1017	1920	6.9	4.3	9.7	817	606	5.4	99.3

* STP, Dry

†The ash recovered after the burn divided by the initial charge times 100.

TABLE B-II

Air Pollution Source SamplingData Sheet 1 - Preliminary Data

Base WPAFB Bldg No. 294 Boiler No. _____
 Date(s) 14-19 Jul 76 Sampling Team _____
 Boiler Type & Make Fairchild-Hiller Film Incinerator/Silver Reclamation Processor
 Rated Capacity _____
 Type Fuel Natural Gas

Stack Geometry

Circular Stack: Wall thickness 2.0" Inside diameter 18.0"
 Distance from outside of sampling port to inside diameter 6.0"
 Stack area 254.5 Number Traverses _____ No Points/Traverse _____
 Location of sampling points along traverse:

Point	% of Diam	Distance from Outer end of Nipple	SKETCH
1	3.3	0.6	Out
2	10.5	1.9	7.9
3	19.4	3.5	9.5
4	32.3	5.8	11.8
5	67.7	12.2	18.2
6	80.6	14.5	20.5
7	89.5	16.1	22.1
8	96.7	17.4	Out

Rectangular duct: Sketch and show dimensions:

TABLE B-III

PARTICULATE SAMPLING DATA SHEET

Run No. 1
Date 15 Jul 76

Plant 294
Base WPAFB

Sample Box No. 2
Meter Box No. 4

QW/QM 0.9605
Co 0.3779

EQUATIONS

$$H = K \cdot V_p$$

$$K = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right] \frac{T_m}{T_s}$$

$$H = 137.5 \frac{T_s}{V_p}$$

Ambient Temp. 91°F
Barometric Press. 29.025
Heater Box Setting 315
Probe Heater Setting MAX
Probe Length Short
Nozzle Area 9.987 x 10⁻⁴ ft²
Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	1050	0	1150	0.060	2.78	37.879	Inlet	Outlet	315	115
5	1100	0	1180	0.065	2.99	42.940	95	81	315	110
4	1110	0	1190	0.065	2.98	48.200	98	82	315	110
3	1120	0	1160	0.065	3.03	53.460	98	82	315	107
2	1130	0	960	0.040	2.10	58.825	98	82	315	105
1	1140	0	900	0.035	1.95	63.620	98	82	315	105
B-6	1157	0	1120	0.050	2.40	67.930	96	84	315	100
5	1207	0	1080	0.050	2.47	72.920	100	86	315	100
4	1217	0	1090	0.055	2.70	77.860	100	86	315	95
3	1227	0	1110	0.055	2.67	83.040	100	86	315	95
2	1237	0	1000	0.040	2.08	88.220	100	86	315	95
1	1247	0	900	0.030	1.68	92.715	100	86	315	95
STOP	1257				Final	96.882				

Approved Oct 73/DAPM/jb/OPR: AF/EHL

TABLE B-IV
AIR POLLUTION ANALYTICAL DATA

Test Number 1

<u>1. Particulates</u> <u>Collection Location</u>	<u>Final Wt.</u> <u>(mg)</u>	<u>Initial Wt.</u> <u>(mg)</u>	<u>Wt. Particles</u> <u>(mg)</u>
Filter (No. <u>90</u>)	<u>822.7</u>	<u>710.0</u>	<u>112.7</u>
Acetone Washings Probe-Front Half Filter Holder	<u>7755.5</u>	<u>7705.7</u>	<u>49.8</u>
Glass Connections - Back Half Filter Holder	<u> </u>	<u> </u>	<u> </u>
Impinger Solution Extracts	<u> </u>	<u> </u>	<u> </u>
Impinger Solutions After Extract	<u> </u>	<u> </u>	<u> </u>
Total Weight of Particulates Collected			<u>162.5</u>

2. Water

<u>Container</u>	<u>Final Wt.</u> <u>(g)</u>	<u>Initial Wt.</u> <u>(g)</u>	<u>Wt. Water</u> <u>(g)</u>
Impinger 1	<u>560.0</u>	<u>689.0</u>	<u>(-) 129.0</u>
Impinger 2	<u>798.3</u>	<u>639.6</u>	<u>158.7</u>
Impinger 3	<u>524.6</u>	<u>469.3</u>	<u>55.3</u>
Impinger 4 (Silica Gel)	<u>734.7</u>	<u>718.8</u>	<u>15.9</u>
Total Weight of Water Collected			<u>100.9</u>

3. Gases (Sampling Port)

<u>Component</u>	<u>Analysis</u> <u>1</u>	<u>Analysis</u> <u>2</u>	<u>Analysis</u> <u>3</u>	<u>Average</u>
Vol % CO ₂ (dry)	<u>4.8</u>	<u>4.6</u>	<u>5.0</u>	<u>4.8</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>13.4</u>	<u>11.8</u>	<u>15.0</u>	<u>13.4</u>
Vol % N ₂ (dry)	<u> </u>	<u> </u>	<u> </u>	<u> </u>

TABLE B-V

AIR POLLUTION ANALYTICAL DATA

Test Number 1

<u>1. Particulates</u>	Final Wt.	Initial Wt.	Wt. Particles
<u>Collection Location</u>	(mg)	(mg)	(mg)
Filter (No. <u> </u>)	_____	_____	_____
Acetone Washings	_____	_____	_____
Probe-Front Half Filter Holder	_____	_____	_____
Glass Connections - Back Half Filter Holder	_____	_____	_____
Impinger Solution Extracts	_____	_____	_____
Impinger Solutions After Extract	_____	_____	_____
Total Weight of Particulates Collected	_____	_____	_____

2. Water

<u>Container</u>	Final Wt.	Initial Wt.	Wt. Water
	(g)	(g)	(g)
Impinger 1	_____	_____	_____
Impinger 2	_____	_____	_____
Impinger 3	_____	_____	_____
Impinger 4 (Silica Gel)	_____	_____	_____
Total Weight of Water Collected	_____	_____	_____

3. Gases (Top of Afterburner Section)

<u>Component</u>	<u>Analysis 1</u>	<u>Analysis 2</u>	<u>Analysis 3</u>	<u>Average</u>	
Vol % CO ₂ (dry)	10.0	11.4	11.2	12.0	11.2
Vol % CO (dry)	0.0	0.0	0.0	0.0	0.0
Vol % O ₂ (dry)	4.6	4.6	5.4	4.8	4.8
Vol % N ₂ (dry)					

TABLE B-VI

PARTICULATE SAMPLING DATA SHEET

Run No. 2Date 15 Jul 76Plant 294Base WPAFBSample Box No. 2Meter Box No. 4QW/QM 0.9605Co 0.3779

EQUATIONS

$$H = K \cdot V_p$$

$$K = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^{1/2} \frac{T_m}{T_s}$$

$$H = 134.6 \frac{T_m}{T_s} V_p$$

Ambient Temp. 93° F
Barometric Press. 28.950Heater Box Setting 315
Probe Heater Setting MAXProbe Length Short
Nozzle Area 9.987 x 10⁻⁴ ft²
Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	1457	0	920	0.045	2.41	97.047	Inlet	Outlet	315	100
5	1507	0	970	0.055	2.86	102.030	98	86	315	100
4	1517	0	1005	0.055	2.79	107.280	98	86	315	95
3	1527	0	960	0.040	2.10	112.540	100	86	315	95
2	1537	0	900	0.030	1.64	117.255	100	86	315	95
1	1547	0	760	0.025	1.53	121.440	100	86	315	95
B-6	1603	0	870	0.040	2.23	125.405	98	86	315	90
5	1613	0	890	0.045	2.49	130.180	100	88	315	90
4	1623	0	890	0.040	2.21	135.195	100	88	315	95
3	1633	0	890	0.040	2.21	139.950	100	88	315	90
2	1643	0	860	0.030	1.69	144.770	100	88	315	90
1	1653	0	830	0.030	1.73	148.950	100	88	315	90
STOP	1703				Final	153.206				

Approved Oct 73/DAPM/jb/OPR: AF/EFL

TABLE B-VII
AIR POLLUTION ANALYTICAL DATA

Test Number 2

<u>1. Particulates</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Particles</u>
<u>Collection Location</u>	<u>(mg)</u>	<u>(mg)</u>	<u>(mg)</u>
Filter (No. <u>95</u>)	<u>753.0</u>	<u>713.7</u>	<u>40.7</u>
Acetone Washings			
Probe-Front Half Filter Holder	<u>7063.9</u>	<u>7023.5</u>	<u>40.4</u>
Glass Connections - Back Half Filter Holder			
Impinger Solution Extracts			
Impinger Solutions After Extract			
Total Weight of Particulates Collected			<u>81.1</u>

2. Water

<u>Container</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Water</u>
	<u>(g)</u>	<u>(g)</u>	<u>(g)</u>
Impinger 1	<u>616.9</u>	<u>560.0</u>	<u>56.9</u>
Impinger 2	<u>802.2</u>	<u>798.3</u>	<u>3.9</u>
Impinger 3	<u>527.9</u>	<u>524.6</u>	<u>3.3</u>
Impinger 4 (Silica Gel)	<u>745.7</u>	<u>734.7</u>	<u>11.2</u>
Total Weight of Water Collected			<u>75.3</u>

3. Gases (Sampling Port)

<u>Component</u>	<u>Analysis 1</u>		<u>Analysis 2</u>		<u>Analysis 3</u>	<u>Average</u>
Vol % CO ₂ (dry)	<u>4.2</u>	<u>4.2</u>	<u>4.2</u>	<u>4.0</u>	<u>4.2</u>	<u>4.2</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>14.2</u>	<u>14.2</u>	<u>14.4</u>	<u>14.2</u>	<u>14.0</u>	<u>14.2</u>
Vol % N ₂ (dry)						

TABLE B-VIII
AIR POLLUTION ANALYTICAL DATA

Test Number 2

1. <u>Particulates</u>	Final Wt. (mg)	Initial Wt. (mg)	Wt. Particles (mg)
<u>Collection Location</u>			
Filter (No. <u> </u>)			
Acetone Washings			
Probe-Front Half Filter Holder			
Glass Connections - Back Half Filter Holder			
Impinger Solution Extracts			
Impinger Solutions After Extract			
Total Weight of Particulates Collected			

2. <u>Water</u>	Final Wt. (g)	Initial Wt. (g)	Wt. Water (g)
<u>Container</u>			
Impinger 1			
Impinger 2			
Impinger 3			
Impinger 4 (Silica Gel)			
Total Weight of Water Collected			

3. <u>Gases</u> (Top of Afterburner Section)					
<u>Component</u>	Analysis 1		Analysis 2		Average
Vol % CO ₂ (dry)	7.4	8.8	7.2	7.2	7.5
Vol % CO (dry)	0.0	0.0	0.0	0.0	0.0
Vol % O ₂ (dry)	8.4	8.4	8.8	8.8	8.6
Vol % N ₂ (dry)					

TABLE B-IX

PARTICULATE SAMPLING DATA SHEET

Run No. 3
 Date 17 Jul 76
 Plant 294
 Base WPAFB
 Sample Box No. 2
 Meter Box No. 4
 QW/QM 0.9605
 Co 0.3779

EQUATIONS

$$H = K \cdot V_p$$

$$K = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \frac{T_m}{T_s}$$

$$H = 134.6 \frac{T_m}{T_s} V_p$$

Ambient Temp. 69°F
 Barometric Press. 29.175
 Heater Box Setting 315
 Probe Heater Setting MAX
 Probe Length Short
 Nozzle Area 9.987 x 10⁻⁴ ft²
 Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	0940	0	940	0.050	2.51	153.498	Inlet	Outlet	315	90
5	0950	0	980	0.050	2.47	158.360	74	62	315	90
4	1000	0	1050	0.055	2.59	163.330	78	64	315	90
3	1010	0	1090	0.055	2.53	168.405	78	64	315	95
2	1020	0	1080	0.045	2.08	173.395	76	64	315	95
1	1030	0	1000	0.040	1.95	178.030	76	64	315	90
B-6	1045	0	1140	0.060	2.68	182.420	76	64	315	90
5	1055	0	1120	0.060	2.72	187.440	78	66	315	90
4	1105	0	1120	0.060	2.72	192.480	78	66	315	90
3	1115	0	1110	0.055	2.52	197.550	80	68	315	90
2	1125	0	1070	0.050	2.35	202.460	80	68	315	90
1	1135	0	1000	0.040	1.97	207.295	80	68	315	90
STOP	1145				Final	211.750				

Approved Oct 73/DAPM/jb/OPB: AF/EFL

TABLE B-X

AIR POLLUTION ANALYTICAL DATA

Test Number 3

<u>1. Particulates</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Particles</u>
<u>Collection Location</u>	<u>(mg)</u>	<u>(mg)</u>	<u>(mg)</u>
Filter (No. <u>94</u>)	<u>728.3</u>	<u>694.5</u>	<u>33.8</u>
Acetone Washings	<u>7259.5</u>	<u>7247.1</u>	<u>12.4</u>
Probe-Front Half Filter Holder			
Glass Connections - Back Half Filter Holder			
Impinger Solution Extracts			
Impinger Solutions After Extract			
Total Weight of Particulates Collected			<u>46.2</u>

2. Water

<u>Container</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Water</u>
	<u>(g)</u>	<u>(g)</u>	<u>(g)</u>
Impinger 1	<u>669.1</u>	<u>614.5</u>	<u>54.6</u>
Impinger 2	<u>651.8</u>	<u>625.6</u>	<u>26.2</u>
Impinger 3	<u>481.0</u>	<u>470.0</u>	<u>11.0</u>
Impinger 4 (Silica Gel)	<u>807.3</u>	<u>794.1</u>	<u>13.2</u>
Total Weight of Water Collected			<u>105.0</u>

3. Gases (Sampling Port)

<u>Component</u>	<u>Analysis 1</u>		<u>Analysis 2</u>		<u>Analysis 3</u>		<u>Average</u>
Vol % CO ₂ (dry)	<u>5.0</u>	<u>5.0</u>	<u>5.0</u>	<u>4.8</u>	<u>4.4</u>	<u>5.0</u>	<u>4.9</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>14.6</u>	<u>14.4</u>	<u>14.0</u>	<u>14.0</u>	<u>14.2</u>	<u>15.0</u>	<u>14.4</u>
Vol % N ₂ (dry)							

TABLE B-XI
AIR POLLUTION ANALYTICAL DATA

Test Number 3

<u>1. Particulates</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Particles</u>
<u>Collection Location</u>	<u>(mg)</u>	<u>(mg)</u>	<u>(mg)</u>
Filter (No. <u> </u>)	<u> </u>	<u> </u>	<u> </u>
Acetone Washings	<u> </u>	<u> </u>	<u> </u>
Probe-Front Half Filter Holder	<u> </u>	<u> </u>	<u> </u>
Glass Connections - Back Half Filter Holder	<u> </u>	<u> </u>	<u> </u>
Impinger Solution Extracts	<u> </u>	<u> </u>	<u> </u>
Impinger Solutions After Extract	<u> </u>	<u> </u>	<u> </u>
Total Weight of Particulates Collected			<u> </u>

2. Water

<u>Container</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Water</u>
	<u>(g)</u>	<u>(g)</u>	<u>(g)</u>
Impinger 1	<u> </u>	<u> </u>	<u> </u>
Impinger 2	<u> </u>	<u> </u>	<u> </u>
Impinger 3	<u> </u>	<u> </u>	<u> </u>
Impinger 4 (Silica Gel)	<u> </u>	<u> </u>	<u> </u>
Total Weight of Water Collected			<u> </u>

3. Gases (Top of Afterburner Section)

<u>Component</u>	<u>Analysis</u>		<u>Analysis</u>		<u>Analysis</u>	<u>Average</u>
	<u>1</u>		<u>2</u>		<u>3</u>	
Vol % CO ₂ (dry)	<u>9.8</u>	<u>12.0</u>	<u>12.4</u>	<u>12.2</u>	<u>12.6</u>	<u>11.8</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>6.4</u>	<u>4.8</u>	<u>4.0</u>	<u>5.0</u>	<u>4.4</u>	<u>4.9</u>
Vol % N ₂ (dry)	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

TABLE B-XII

PARTICULATE SAMPLING DATA SHEET

Run No. 4
Date 17 Jul 76

Plant 294
Base WPAFB

Sample Box No. 2
Meter Box No. 4

QW/QM 0.9605
Co 0.3779

EQUATIONS

$$H = K \cdot V_p$$

$$K = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \frac{T_m}{T_s}$$

$$H = 137.5 \frac{T_m}{T_s} V_p$$

Ambient Temp. 79°F
Barometric Press. 29.160

Heater Box Setting 315
Probe Heater Setting MAX

Probe Length Short
Nozzle Area $9.987 \times 10^{-4} \text{ ft}^2$
Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	1345	0	980	0.060	3.05	211.886	Inlet	Outlet	315	75
5	1355	0	960	0.060	3.11	217.210	80	70	315	80
4	1405	0	950	0.055	2.87	222.600	82	70	315	85
3	1415	0	930	0.040	2.10	227.850	82	70	315	85
2	1425	0	880	0.040	2.20	232.425	80	70	315	85
1	1535	0	850	0.030	1.69	237.045	82	70	315	85
B-6	1449	0	860	0.050	2.79	241.165	80	70	315	85
5	1459	0	870	0.050	2.77	246.330	82	70	315	80
4	1509	0	880	0.050	2.75	251.465	82	70	315	85
3	1519	0	880	0.045	2.48	256.630	82	70	315	90
2	1529	0	860	0.045	2.51	261.600	82	70	315	85
1	1539	0	800	0.030	1.76	266.590	82	72	315	85
STOP	1549				Final	270.824				

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TABLE B-XIII
AIR POLLUTION ANALYTICAL DATA

Test Number 4

1. Particulates

Collection Location

Filter (No. 93)

Acetone Washings

Probe-Front Half Filter Holder

Glass Connections - Back Half Filter Holder

Impinger Solution Extracts

Impinger Solutions After Extract

Total Weight of Particulates Collected

Final Wt.
(mg)

Initial Wt.
(mg)

Wt. Particles
(mg)

734.5

682.7

51.8

7691.9

7677.2

14.7

62.1

2. Water

Container

Impinger 1

Impinger 2

Impinger 3

Impinger 4 (Silica Gel)

Total Weight of Water Collected

Final Wt.
(g)

Initial Wt.
(g)

Wt. Water
(g)

693.4

649.1

44.3

638.0

631.8

6.2

475.5

471.8

3.7

822.2

807.3

14.9

69.1

3. Gases (Sampling Port)

Component

Analysis
1

Analysis
2

Analysis
3

Average

Vol % CO₂ (dry)

3.0

2.8

2.4

3.2

3.6

3.4

3.1

Vol % CO (dry)

0.0

0.0

0.0

0.0

0.0

0.0

0.0

Vol % O₂ (dry)

16.6

17.0

17.0

15.8

16.0

15.4

16.3

Vol % N₂ (dry)

TABLE B-XIV
AIR POLLUTION ANALYTICAL DATA

Test Number 4

<u>1. Particulates</u>	Final Wt.	Initial Wt.	Wt. Particles
<u>Collection Location</u>	(mg)	(mg)	(mg)
Filter (No. <u> </u>)	_____	_____	_____
Acetone Washings	_____	_____	_____
Probe-Front Half Filter Holder	_____	_____	_____
Glass Connections - Back Half Filter Holder	_____	_____	_____
Impinger Solution Extracts	_____	_____	_____
Impinger Solutions After Extract	_____	_____	_____
Total Weight of Particulates Collected			_____

2. Water

<u>Container</u>	Final Wt.	Initial Wt.	Wt. Water
	(g)	(g)	(g)
Impinger 1	_____	_____	_____
Impinger 2	_____	_____	_____
Impinger 3	_____	_____	_____
Impinger 4 (Silica Gel)	_____	_____	_____
Total Weight of Water Collected			_____

3. Gases (Top of Afterburner Section)

<u>Component</u>	<u>Analysis 1</u>		<u>Analysis 2</u>		<u>Analysis 3</u>		<u>Average</u>
Vol % CO ₂ (dry)	7.8	7.2	7.0	7.8	6.8	6.6	7.2
Vol % CO (dry)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vol % O ₂ (dry)	7.2	9.2	8.6	8.4	9.0	9.4	8.6
Vol % N ₂ (dry)	_____	_____	_____	_____	_____	_____	_____

TABLE B-XV

PARTICULATE SAMPLING DATA SHEET

Run No. 5Date 18 Jul 76Plant 294Base WPAFBSample Box No. 2Meter Box No. 4QW/QM 0.9605Co 0.3779

EQUATIONS

$$H = K \cdot V_p$$

$$K = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \frac{T_m}{T_s}$$

$$H = 134.6 \frac{T_s}{T_m} V_p$$

Ambient Temp. 69° F
Barometric Press. 29.305Heater Box Setting 315
Probe Heater Setting MAXProbe Length Short
Nozzle Area 9.987 x 10⁻⁴ ft²
Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	0920	0	1070	0.050	2.30	270.980	Inlet	Outlet	315	70
	0930	0	1080	0.060	2.76	275.690	72	62	315	70
	0940	0	1120	0.060	2.71	280.790	78	64	315	75
	0950	0	1180	0.065	2.84	285.835	82	64	315	75
	1000	0	1100	0.055	2.53	291.020	82	66	315	80
B-6	1010	0	1050	0.050	2.39	295.990	84	68	315	80
	1025	0	1130	0.050	2.26	300.775	82	68	315	75
	1035	0	1140	0.055	2.48	305.510	84	70	315	80
	1045	0	1130	0.060	2.74	310.400	86	70	315	80
	1055	0	1130	0.055	2.51	315.520	88	70	315	85
STOP	1105	0	1080	0.045	2.12	320.510	88	70	315	85
	1115	0	1000	0.030	1.49	325.140	86	70	315	85
	1125				Final	328.995				

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TABLE B-XVI
AIR POLLUTION ANALYTICAL DATA

Test Number 5

<u>1. Particulates</u> <u>Collection Location</u>	<u>Final Wt.</u> <u>(mg)</u>	<u>Initial Wt.</u> <u>(mg)</u>	<u>Wt. Particles</u> <u>(mg)</u>
Filter (No. <u>92</u>)	<u>719.1</u>	<u>690.2</u>	<u>28.9</u>
Acetone Washings Probe-Front Half Filter Holder	<u>7220.4</u>	<u>7187.2</u>	<u>33.2</u>
Glass Connections - Back Half Filter Holder	<u> </u>	<u> </u>	<u> </u>
Impinger Solution Extracts	<u> </u>	<u> </u>	<u> </u>
Impinger Solutions After Extract	<u> </u>	<u> </u>	<u> </u>
Total Weight of Particulates Collected			<u>62.1</u>

2. Water

<u>Container</u>	<u>Final Wt.</u> <u>(g)</u>	<u>Initial Wt.</u> <u>(g)</u>	<u>Wt. Water</u> <u>(g)</u>
Impinger 1	<u>653.6</u>	<u>592.2</u>	<u>61.4</u>
Impinger 2	<u>641.1</u>	<u>633.3</u>	<u>7.8</u>
Impinger 3	<u>473.3</u>	<u>470.5</u>	<u>2.8</u>
Impinger 4 (Silica Gel)	<u>752.2</u>	<u>740.0</u>	<u>12.2</u>
Total Weight of Water Collected			<u>84.2</u>

3. Gases (Sampling Port)

<u>Component</u>	<u>Analysis</u> <u>1</u>		<u>Analysis</u> <u>2</u>		<u>Analysis</u> <u>3</u>		<u>Average</u>
Vol % CO ₂ (dry)	<u>4.4</u>	<u>4.6</u>	<u>4.4</u>	<u>5.0</u>	<u>4.8</u>	<u>4.6</u>	<u>4.6</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>14.8</u>	<u>13.6</u>	<u>13.6</u>	<u>13.6</u>	<u>14.0</u>	<u>13.8</u>	<u>13.9</u>
Vol % N ₂ (dry)	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

AIR POLLUTION ANALYTICAL DATA

Test Number 5

<u>1. Particulates</u>	Final Wt.	Initial Wt.	Wt. Particles
<u>Collection Location</u>	(mg)	(mg)	(mg)
Filter (No. <u> </u>)	_____	_____	_____
Acetone Washings	_____	_____	_____
Probe-Front Half Filter Holder	_____	_____	_____
Glass Connections - Back Half Filter Holder	_____	_____	_____
Impinger Solution Extracts	_____	_____	_____
Impinger Solutions After Extract	_____	_____	_____
Total Weight of Particulates Collected	_____	_____	_____

2. Water

<u>Container</u>	Final Wt.	Initial Wt.	Wt. Water
	(g)	(g)	(g)
Impinger 1	_____	_____	_____
Impinger 2	_____	_____	_____
Impinger 3	_____	_____	_____
Impinger 4 (Silica Gel)	_____	_____	_____
Total Weight of Water Collected	_____	_____	_____

3. Gases (Top of Afterburner Section)

<u>Component</u>	<u>Analysis</u>		<u>Analysis</u>		<u>Analysis</u>		<u>Average</u>
	1		2		3		
Vol % CO ₂ (dry)	12.2	12.6	13.6	14.0	13.8	11.0	12.9
Vol % CO (dry)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vol % O ₂ (dry)	4.2	4.8	3.2	4.4	4.2	6.4	4.5
Vol % N ₂ (dry)	_____	_____	_____	_____	_____	_____	_____

TABLE B-XVIII

PARTICULATE SAMPLING DATA SHEET

Run No. 6
Date 18 Jul 76

Plant 294
Base WPAFB

Sample Box No. 2
Meter Box No. 4

QW/QM 0.9605
Co 0.3779

EQUATIONS

$$H = K \cdot V \cdot P$$

$$K = \left[\frac{5130 \cdot F \cdot d \cdot C_p \cdot A}{C_o} \right]^2 \frac{T_m}{T_s}$$

$$H = 137.5 \cdot T_s \cdot V_p$$

Ambient Temp. 68°F
Barometric Press. 29.300

Heater Box Setting 315
Probe Heater Setting MAX

Probe Length Short
Nozzle Area 9.987 x 10⁻⁴ ft²
Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	1325	0	1000	0.050	2.53	329.194	Inlet	Outlet	315	85
5	1335	0	1000	0.050	2.54	334.180	86	74	315	95
4	1345	0	1010	0.060	3.04	339.170	88	74	315	100
3	1355	0	970	0.055	2.87	344.500	90	76	315	100
2	1405	0	930	0.040	2.14	349.720	88	76	315	100
1	1415	0	880	0.025	1.39	354.460	88	76	315	95
B-6	1430	0	900	0.045	2.46	358.263	86	76	315	90
5	1440	0	890	0.050	2.76	363.170	88	76	315	95
4	1450	0	890	0.045	2.49	368.330	90	78	315	95
3	1500	0	880	0.040	2.23	373.340	90	78	315	95
2	1510	0	870	0.040	2.25	378.150	90	78	315	100
1	1520	0	800	0.035	2.08	382.955	90	78	315	100
STOP	1530				Final	387.547				

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TABLE B-XIX
AIR POLLUTION ANALYTICAL DATA

Test Number 6

<u>1. Particulates</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Particles</u>
<u>Collection Location</u>	<u>(mg)</u>	<u>(mg)</u>	<u>(mg)</u>
Filter (No. <u>91</u>)	<u>699.1</u>	<u>678.8</u>	<u>20.3</u>
Acetone Washings			
Probe-Front Half Filter Holder	<u>7058.5</u>	<u>7023.8</u>	<u>34.7</u>
Glass Connections - Back Half Filter Holder			
Impinger Solution Extracts			
Impinger Solutions After Extract			
Total Weight of Particulates Collected			<u>55.0</u>

2. Water

<u>Container</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Water</u>
	<u>(g)</u>	<u>(g)</u>	<u>(g)</u>
Impinger 1	<u>697.4</u>	<u>653.6</u>	<u>43.8</u>
Impinger 2	<u>646.7</u>	<u>641.1</u>	<u>5.6</u>
Impinger 3	<u>475.9</u>	<u>473.3</u>	<u>2.6</u>
Impinger 4 (Silica Gel)	<u>765.0</u>	<u>752.2</u>	<u>11.8</u>
Total Weight of Water Collected			<u>63.8</u>

3. Gases (Sampling Port)

<u>Component</u>	<u>Analysis 1</u>		<u>Analysis 2</u>		<u>Analysis 3</u>		<u>Average</u>
Vol % CO ₂ (dry)	<u>3.0</u>	<u>3.4</u>	<u>3.2</u>	<u>2.8</u>	<u>2.6</u>	<u>2.8</u>	<u>3.0</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>15.0</u>	<u>14.6</u>	<u>14.8</u>	<u>13.6</u>	<u>13.6</u>	<u>14.0</u>	<u>14.3</u>
Vol % N ₂ (dry)							

TABLE B-XX

AIR POLLUTION ANALYTICAL DATA

Test Number 61. ParticulatesCollection Location

Final Wt. (mg)	Initial Wt. (mg)	Wt. Particles (mg)
-------------------	---------------------	-----------------------

Filter (No.)

Acetone Washings

Probe-Front Half Filter Holder

Glass Connections - Back Half Filter Holder

Impinger Solution Extracts

Impinger Solutions After Extract

Total Weight of Particulates Collected

2. WaterContainer

Final Wt. (g)	Initial Wt. (g)	Wt. Water (g)
------------------	--------------------	------------------

Impinger 1

Impinger 2

Impinger 3

Impinger 4 (Silica Gel)

Total Weight of Water Collected

3. Gases (Top of Afterburner Section)ComponentAnalysis
1Analysis
2Analysis
3

Average

Vol % CO₂ (dry)

10.0	10.0	9.8	7.6	6.8	6.8
------	------	-----	-----	-----	-----

8.5

Vol % CO (dry)

0.0	0.0	0.0	0.0	0.0	0.0
-----	-----	-----	-----	-----	-----

0.0

Vol % O₂ (dry)

8.2	8.6	9.2	9.8	9.8	10.0
-----	-----	-----	-----	-----	------

9.3

Vol % N₂ (dry)

TABLE B-XXI

PARTICULATE SAMPLING DATA SHEET

Run No. 7
 Date 19 Jul 76

Plant 294
 Base WPAFB

Sample Box No. 2
 Meter Box No. 4

QW/QM 0.9605
 Co 0.3779

EQUATIONS

$$H = K \cdot V_p$$

$$K = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A^2}{C_o} \right] \frac{T_m}{T_s}$$

$$H = 137.5 \frac{T_m}{T_s} V_p$$

Ambient Temp. 78°F
 Barometric Press. 29.360
 Heater Box Setting 315
 Probe Heater Setting MAX
 Probe Length Short
 Nozzle Area $9.987 \times 10^{-4} \text{ ft}^2$
 Cp 0.93

Schematic of Stack Cross Section

Traverse Point Number	Sampling Time	Static Pressure	Stack Temperature	Velocity Head	Orifice Diff. Pressure	Gas Sample Volume	Gas Meter Temp		Sample Box Temp.	Impinger Temp.
A-6	1055	0	1030	0.050	2.46	387.716	Inlet	Outlet	315	85
5	1105	0	1030	0.055	2.72	392.660	80	70	315	90
4	1115	0	1030	0.055	2.74	397.770	86	74	315	90
3	1125	0	1020	0.050	2.51	402.930	88	74	315	95
2	1135	0	1060	0.060	2.94	407.935	88	74	315	95
1	1145	0	1020	0.050	2.52	413.120	90	74	315	100
B-6	1159	0	1020	0.050	2.52	418.122	88	76	315	95
5	1209	0	1020	0.050	2.52	423.100	88	76	315	95
4	1219	0	1020	0.050	2.52	428.080	90	76	315	100
3	1229	0	1000	0.045	2.31	433.085	92	78	315	100
2	1239	0	980	0.040	2.08	437.940	90	78	315	100
1	1249	0	970	0.040	2.09	442.550	88	78	315	100
STOP	1259				Final	447.137				

Approved Oct 73/DAPM/jb/OPR: AF/EPL

TABLE B-XXII
AIR POLLUTION ANALYTICAL DATA

Test Number 7

<u>1. Particulates</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Particles</u>
<u>Collection Location</u>	<u>(mg)</u>	<u>(mg)</u>	<u>(mg)</u>
Filter (No. <u>96</u>)	<u>735.6</u>	<u>686.2</u>	<u>49.4</u>
Acetone Washings	<u>7182.7</u>	<u>7134.1</u>	<u>48.6</u>
Probe-Front Half Filter Holder			
Glass Connections - Back Half Filter Holder			
Impinger Solution Extracts			
Impinger Solutions After Extract			
Total Weight of Particulates Collected			<u>98.0</u>

2. Water

<u>Container</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Water</u>
	<u>(g)</u>	<u>(g)</u>	<u>(g)</u>
Impinger 1	<u>641.9</u>	<u>587.8</u>	<u>54.1</u>
Impinger 2	<u>578.5</u>	<u>570.8</u>	<u>7.7</u>
Impinger 3	<u>468.3</u>	<u>465.9</u>	<u>2.4</u>
Impinger 4 (Silica Gel)	<u>741.9</u>	<u>729.5</u>	<u>12.4</u>
Total Weight of Water Collected			<u>86.6</u>

3. Gases (Sampling Port)

<u>Component</u>	<u>Analysis 1</u>		<u>Analysis 2</u>		<u>Analysis 3</u>		<u>Average</u>
Vol % CO ₂ (dry)	<u>5.4</u>	<u>4.8</u>	<u>5.0</u>	<u>4.0</u>	<u>3.6</u>	<u>3.4</u>	<u>4.4</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>12.6</u>	<u>13.0</u>	<u>12.8</u>	<u>14.2</u>	<u>14.8</u>	<u>14.6</u>	<u>13.7</u>
Vol % N ₂ (dry)							

TABLE B-XXIII
AIR POLLUTION ANALYTICAL DATA

Test Number 7

<u>1. Particulates</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Particles</u>
<u>Collection Location</u>	<u>(mg)</u>	<u>(mg)</u>	<u>(mg)</u>
Filter (No. <u> </u>)	<u> </u>	<u> </u>	<u> </u>
Acetone Washings	<u> </u>	<u> </u>	<u> </u>
Probe-Front Half Filter Holder	<u> </u>	<u> </u>	<u> </u>
Glass Connections - Back Half Filter Holder	<u> </u>	<u> </u>	<u> </u>
Impinger Solution Extracts	<u> </u>	<u> </u>	<u> </u>
Impinger Solutions After Extract	<u> </u>	<u> </u>	<u> </u>
Total Weight of Particulates Collected			<u> </u>

2. Water

<u>Container</u>	<u>Final Wt.</u>	<u>Initial Wt.</u>	<u>Wt. Water</u>
	<u>(g)</u>	<u>(g)</u>	<u>(g)</u>
Impinger 1	<u> </u>	<u> </u>	<u> </u>
Impinger 2	<u> </u>	<u> </u>	<u> </u>
Impinger 3	<u> </u>	<u> </u>	<u> </u>
Impinger 4 (Silica Gel)	<u> </u>	<u> </u>	<u> </u>
Total Weight of Water Collected			<u> </u>

3. Gases (Top of Afterburner Section)

<u>Component</u>	<u>Analysis</u>		<u>Analysis</u>		<u>Analysis</u>		<u>Average</u>
	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	
Vol % CO ₂ (dry)	<u>10.0</u>	<u>9.2</u>	<u>9.4</u>	<u>9.0</u>	<u>10.6</u>	<u>10.6</u>	<u>9.7</u>
Vol % CO (dry)	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Vol % O ₂ (dry)	<u>6.6</u>	<u>6.8</u>	<u>6.4</u>	<u>7.0</u>	<u>6.4</u>	<u>6.8</u>	<u>6.7</u>
Vol % N ₂ (dry)	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

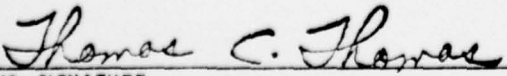
APPENDIX C

ANALYSIS OF PROBE ASH

CHEMICAL ANALYSIS		USAF ENVIRONMENTAL HEALTH LABORATORY/McCLELLAN (EHL) McCLELLAN AFB, CA 95652	
1. SUBMITTED BY Capt Normington - AAF-609		2. DATE REC'D 13 Sep 76	3. SAMPLE NUMBER 76AP 10042-48
4. ANALYSIS REQUESTED Percent Silver, Silicon, and Aluminum		5. ANALYST T. Thomas	
6. SAMPLE DESCRIPTION Ash			
7. METHODOLOGY Emission Spectrography			
8. RESULTS			
<u>Percent Element in Ash</u>			
LN	SN	Silver	Aluminum
AP 10042	1	0.59	1.13
10043	2	1.56	1.12
10044	3	1.30	0.90
10045	4	0.96	0.30
10046	5	2.40	0.54
10047	6	0.74	0.26
10048	7	0.50	0.48
			7.2
			6.4
			1.60
			1.60
			2.80
			0.86
			4.2
9. REMARKS			
10. SIGNATURE <i>Thomas C. Thomas</i>		11. DATE 15 Sep 76	
THOMAS C. THOMAS, Chemist			

APPENDIX D

SILVER ANALYSIS OF FILTER ASH

CHEMICAL ANALYSIS		USAF ENVIRONMENTAL HEALTH LABORATORY/McCLELLAN (EHL) McCLELLAN AFB, CA 95652	
1. SUBMITTED BY Sgt Conway - AAF-609		2. DATE REC'D 23 Jul 76	3. SAMPLE NUMBER 76 AP 8717-8724
4. ANALYSIS REQUESTED Ag		5. ANALYST Mesman, Logsdon, Thomas	
6. SAMPLE DESCRIPTION Filter Papers			
7. METHODOLOGY Atomic Absorption			
8. RESULTS			
LN	SN	Total Milligrams of Silver	
76 AP 8717	AAF 609-1F	2.08	
76 AP 8918	2F	1.68	
76 AP 8719	3F	1.90	
76 AP 8720	4F	2.18	
76 AP 8721	5F	1.10	
76 AP 8722	6F	1.78	
76 AP 8723	7F	2.28	
76 AP 8724	8 Blank	-	
9. REMARKS			
10. SIGNATURE  THOMAS C. THOMAS, Chemist		11. DATE 28 July 1976	

APPENDIX E

ANALYSIS OF REFRACTORY LINING

CHEMICAL ANALYSIS		USAF ENVIRONMENTAL HEALTH LABORATORY/McCLELLAN (EHL) McCLELLAN AFB, CA 95652													
1. SUBMITTED BY Capt Normington- AAF-609		2. DATE REC'D 17 Sep 76	3. SAMPLE NUMBER 27 OT 10650												
4. ANALYSIS REQUESTED Qualitative and Quantitative		5. ANALYST T. Thomas													
6. SAMPLE DESCRIPTION Refractory Lining from Fairchild-Hiller Silver Reclamation Processor															
7. METHODOLOGY X-Ray & Emission Spectroscopy															
8. RESULTS <p>Emission Spectrographic Analysis of the Firebrick showed:</p> <table border="0"> <thead> <tr> <th><u>Major (>10%)</u></th> <th><u>Minor (1-10%)</u></th> <th><u>Trace (0-1%)</u></th> </tr> </thead> <tbody> <tr> <td>Silicon</td> <td>Iron</td> <td>Magnesium</td> </tr> <tr> <td>Aluminum</td> <td>Titanium</td> <td>Silver</td> </tr> <tr> <td>Calcium</td> <td></td> <td>Sodium</td> </tr> </tbody> </table> <p>X-Ray Analysis showed the Firebrick to be possibly a mixture of:</p> <ul style="list-style-type: none"> a. Silicon Dioxide, SiO_2 (αcristobalite) b. Calcium Silicate, Ca_2SiO_4 c. Aluminum Silicate, $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$ d. Iron Oxide, Fe_2O_3 				<u>Major (>10%)</u>	<u>Minor (1-10%)</u>	<u>Trace (0-1%)</u>	Silicon	Iron	Magnesium	Aluminum	Titanium	Silver	Calcium		Sodium
<u>Major (>10%)</u>	<u>Minor (1-10%)</u>	<u>Trace (0-1%)</u>													
Silicon	Iron	Magnesium													
Aluminum	Titanium	Silver													
Calcium		Sodium													
9. REMARKS <p>Obviously a poured refractory cement lining.</p> <p><i>Thomas C. Thomas</i></p>															
10. SIGNATURE THOMAS C. THOMAS, Chemist		11. DATE 29 September 1976													